JANUARY 17, 1983

CHEMICAL & ENGINEERING

NEWS

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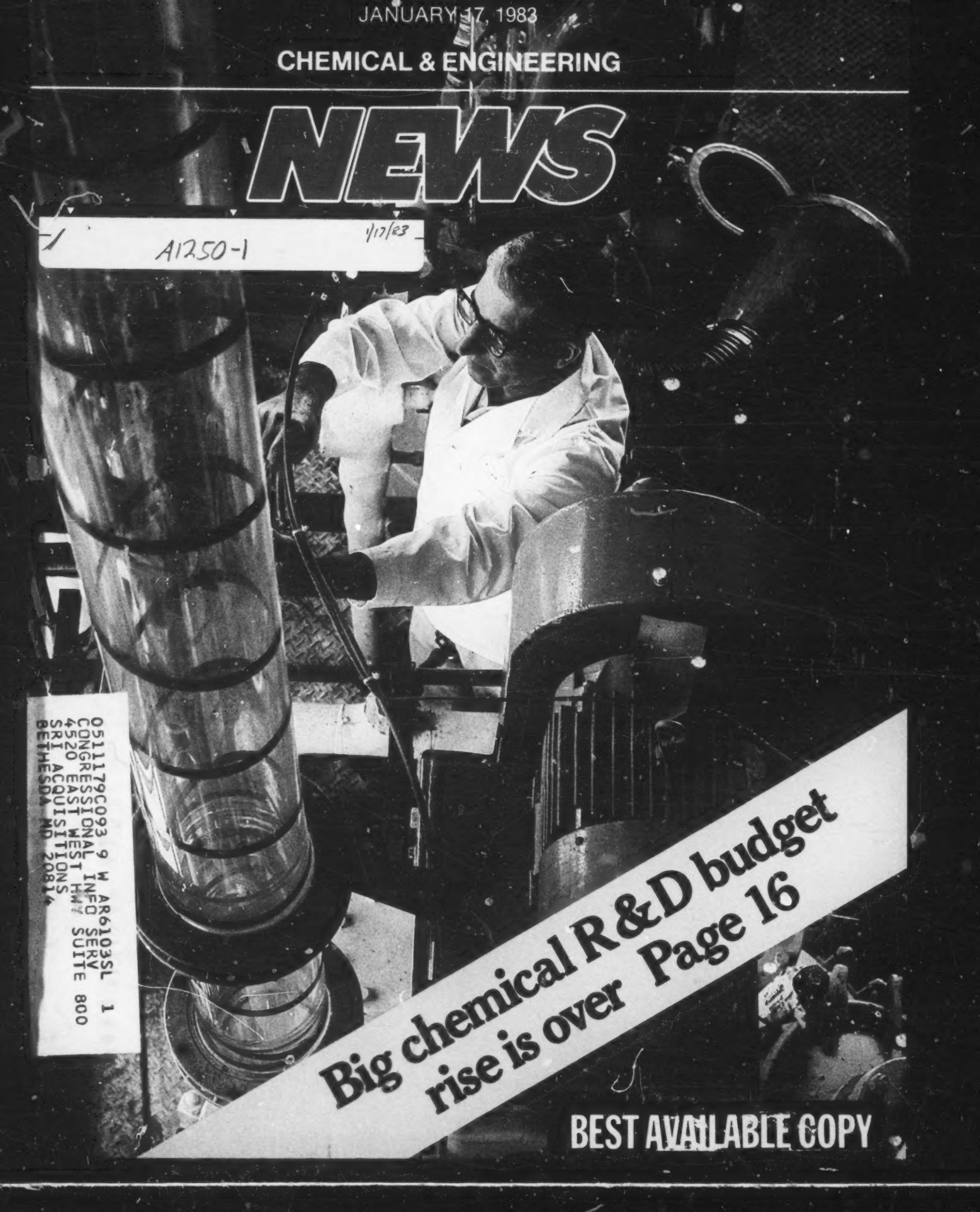

Big chemical R&D budget rise is over

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Cover: Medicinal research pilot plant at Pfizer's research center, Groton, Conn.

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Cover Story

U.S. basic chemical companies anticipate a much slower rate of R&D spending in 1983 compared to 1982. **Page 16**

Chemical Firms Will Reduce R&D Spending in 1983

U.S. basic chemical companies anticipate only 5% hike in R&D funding in 1983 after boosting spending 13% last year

William J. Storck, C&EN New York

The recession in the U.S. chemical industry finally seems to be taking its toll on research and development spending among major companies. Current plans among 15 large basic chemical firms surveyed by C&EN call for spending to be up only 5% this year, to a combined total of $1.99 billion, after a 13% rise in 1982.

In the depths of the long-running recession, future-oriented spending is getting a close look at all companies. For instance, plans for capital spending show a marked decrease in 1983 after similar lower spending levels in 1982 (C&EN, Dec. 13, 1982, page 17).

R&D spending has resisted that pattern, having held up fairly well in 1982 and increasing again in 1983, although not by much. But 1983 will break a long string of healthy R&D spending increases. This year, for only the second time in a decade, R&D spending will grow less than 10% from the previous year. The other time within a decade was in 1978, when R&D spending was up 7% from the year before.

It is only natural to blame the economy. With chemical industry sales off more than 7% from last year and earnings off more than 30%, chemical industry executives are closely examining R&D spending as well as other budgets. Last year, Stauffer Chemical chairman and chief executive officer H. Barclay Morley told C&EN in an interview that, given the economic climate, he could not recommend very much growth in any of the company's budgets for this year (C&EN, Nov. 8, 1982, page 14).

This attitude seems to be pervasive in the industry. In its survey of these 15 chemical companies, C&EN found that although the R&D budget will decline this year at only one company, three more firms will hold funding at 1982 levels, and an additional four will hold increases to 5% or less. Thus, eight of the 15 chemical companies surveyed probably will spend less on R&D, adjusted for inflation, in 1983 than they did in 1982.

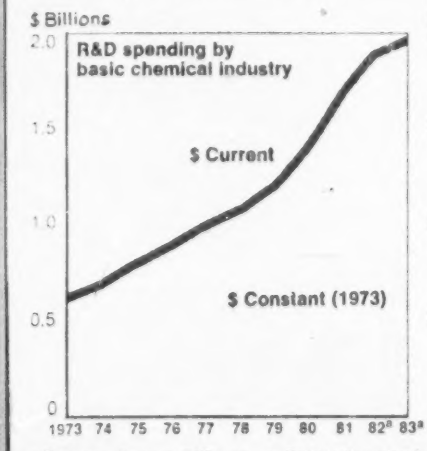
As the recession deepened during 1982, chemical companies scaled back their R&D spending plans. Originally, 13 of the companies on both this year's and last year's list had slated spending of $1.91 billion. However, by the end of 1982, actual spending is estimated at about $1.81 billion, or 5% less than originally budgeted.

Still, in spite of the cutback in 1982, the 15 chemical companies surveyed this year by C&EN finished 1982 with R&D spending increasing to $1.90 billion, 13% more than in 1981. Most of the companies surveyed maintained healthy increases last year, but two—Celanese and Diamond Shamrock—decreased R&D spending. Celanese spending fell almost 4% from 1981 to $100 million; and Diamond Shamrock spent $47 million, down 11% from the year before.

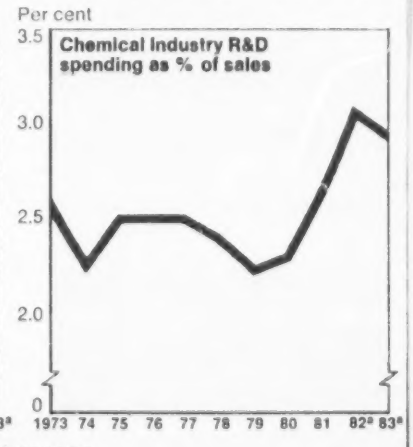
For this year, Celanese is budgeting its R&D spending at about the same pace as in 1982, but Diamond Shamrock will allocate 2% less, to about $46 million. Diamond Shamrock, though, has transferred some of its R&D spending to a joint venture, so that its R&D effort is greater than the budget figure reflects.

This year's 5% increase for all 15 firms means that in terms of real-dollar spending, there won't be much of an increase in 1983. Battelle Columbus Laboratories estimates that

R&D budget rises will about match inflation in 1983...



...and will drop as a per cent of corporate sales



a Estimates Sources: C&EN surveys, Battelle Columbus Laboratories

Companies will halt string of big R&D spending increases in 1983

$ Millions	Worldwide R&D spending: Planned 1983	Actual 1982	Planned 1982	1981	1980	1979	1978	1977	Change from previous year: 1983	1982	R&D spending as % of sales: 1982	1981
Air Products	$ 40	$ 37	$ 35	$ 32	$ 30	$ 24	$ 23	$ 24	8%	16%	2.4%	2.0%
Allied	186	186	190	152	105	70	56	51	0	22	2.9	2.4
American Cyanamid	200	180	180	164	142	124	108	96	11	10	5.1	4.5
Celanese	100	100	118	104	94	92	83	77	0	−4	3.3	2.8
Diamond Shamrock	46	47	64	53	45	37	32	26	−2	−11	1.4	1.6
Dow Chemical	480	455	525	404	314	269	232	203	5	13	4.2	3.4
Ethyl	39[a]	38	b	37	34	29	25	28	3	3	2.3	2.1
W. R. Grace	71	59	65	55	45	42	37	32	20	7	1.0	0.8
Hercules	68	67	66	61	53	47	40	37	1	10	2.7	2.2
Monsanto	284	264	260	221	204	161	136	132	8	19	4.2	3.2
Olin	48[a]	45	b	39	31	26	25	25	7	15	2.5	1.9
Pennwalt	34	30	34	27	24	22	23	21	13	11	3.1	2.6
Rohm & Haas	94[a]	91	90	77	67	54	49	45	3	18	4.9	4.1
Stauffer Chemical	64	60	62	51	44	37	34	33	7	18	3.9	3.0
Union Carbide	238	237	222	201	166	161	156	156	0	18	2.7	2.0
TOTAL	$1991	$1896	$1911[c]	$1678	$1398	$1195	$1059	$986			3.1%	2.6%
ANNUAL CHANGE	5%	13%	19%[c]	20%	17%	13%	7%	11%				

a C&EN estimate. b Not included in previous survey. c Excluding Ethyl and Olin.

inflation affecting R&D in 1983 will be about 4.2%. Thus, the increase of real-dollar R&D spending for 1983 will be only slight.

This bodes rather ill for R&D employment next year. Because the major part of R&D spending is for people, a flat year for budgeting means little or no expansion of R&D staffs.

A spokesman for W. R. Grace, for instance, says that when that company recruits on campuses for people for R&D, it meets very little competition from other chemical companies.

W. R. Grace has budgeted the biggest increase in R&D spending among the companies surveyed. Grace says that its spending will rise about 20% in 1983 to $71 million. Some of this money is going into a biotechnology effort. Grace has said that it will spend about $50 million over the next five years on biotechnology research.

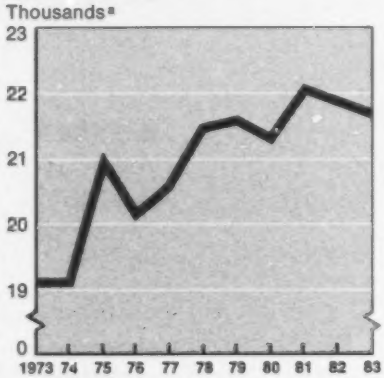
Only two other companies have budgeted increases of more than 10% for this year. Pennwalt says that it will increase spending about 13% from last year to $34 million. And American Cyanamid plans to spend about $200 million, 11% more than last year.

With R&D budgets increasing only about 5% this year, R&D as a percentage of company sales probably will decline. If the chemical industry begins its recovery this year, sales almost certainly will rise faster than the 5% increase slated for R&D. Thus, R&D spending as a percentage of sales will drop from 1982's 3.1%. The 1982 percentage, however, is artificially high because, at the same time that R&D spending was rising, sales among chemical companies were dropping. This accounts for much of the increase in the ratio of 3.1% from just 2.6% in 1981.

For years, R&D spending in the chemical industry has been rising healthily. Between 1972 and 1982, R&D spending at the 15 companies surveyed has increased at an average annual rate of 12.5%, and for the past five years, the increase has averaged 14% annually. So, a 5% increase this year doesn't look like much.

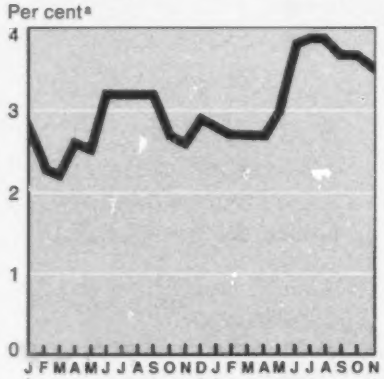
However, R&D spending probably won't stay down forever. Most of the companies surveyed say that they are merely on hold until they are sure of an economic recovery. Then, the feeling is that spending for R&D once again will begin to match its historical growth. □

Companies put brakes on professional R&D staffs...



a Full-time equivalent R&D scientists and engineers in basic chemical industry at beginning of year. **Sources:** National Science Foundation, C&EN surveys

...as technical professional unemployment stays high



a Unemployment rate for professional and technical white-collar workers. **Source:** Bureau of Labor Statistics

R&D group that is disproportionately large by industry standards compared to the scale of our commercial operation."

The sale will not include Ring Around Products, a Zoecon subsidiary that specializes in seeds. That operation, which has performed poorly over the past two years, likely will be sold separately by Occidental. However, Diekman points out, Sandoz owns two U.S. seed companies and a Dutch seed company. Therefore, he says, Zoecon's research into genetic engineering with the goal of improved seed varieties will have a commercial outlet within the organization.

Occidental purchased Zoecon in 1977 for about $50 million. The sale of Zoecon and other Occidental assets is part of an effort to reduce the company's debt load that was incurred in the $4-billion acquisition of Cities Services in 1981. Ring Around was acquired shortly thereafter to diversify Zoecon into areas less heavily regulated than pesticides. □

Ink business poised to pick up again

The U.S. ink business surpassed $250 million in shipments in 1962, $500 million in 1972, and $1 billion in 1979, according to the Commerce Department. A recent consulting report says that shipments hit about $1.4 billion in 1982 and will be $1.7 billion in 1987.

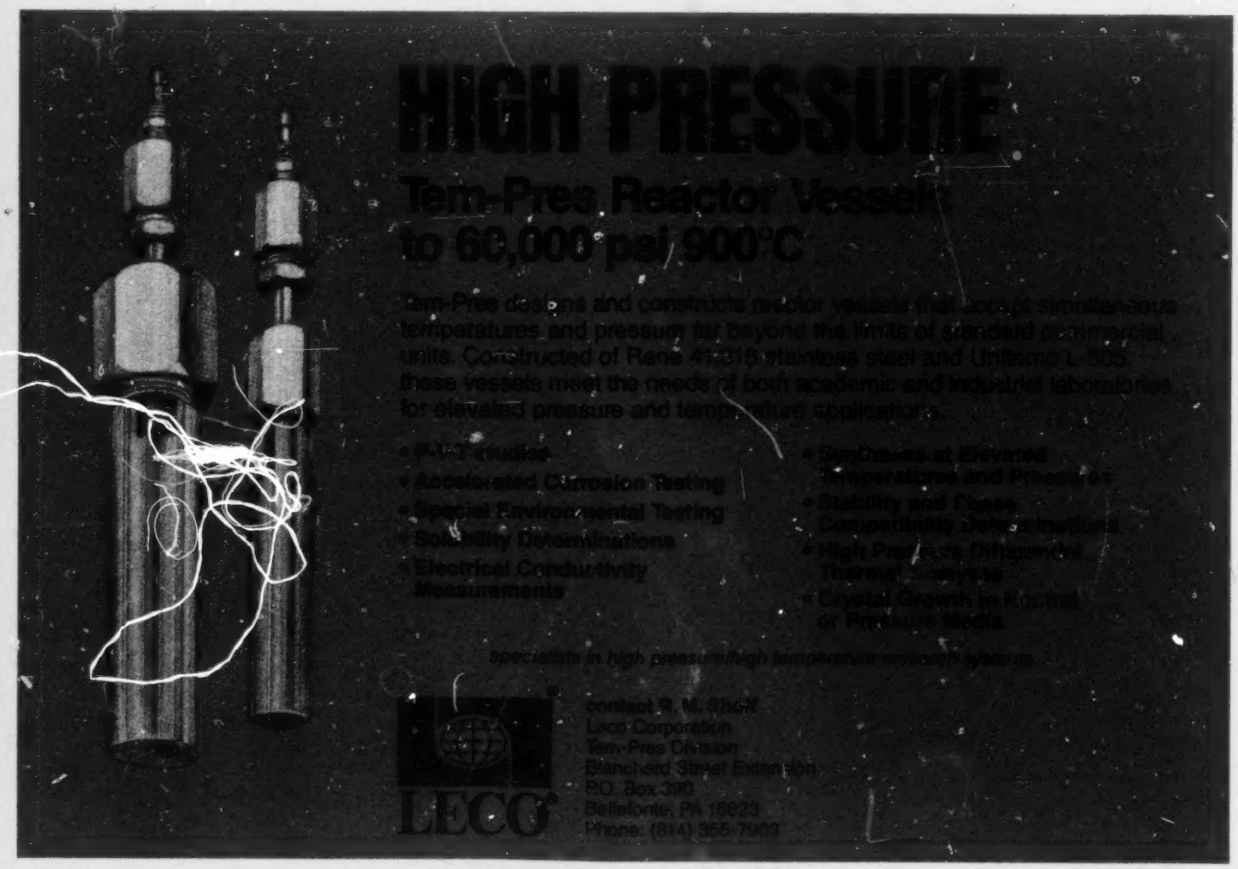
The only trouble with such apparent expansion, says Business Communications Co. of Stamford, Conn., is that nothing happened last year. "An industry tradition was broken," the consultant firm says. "Up until 1982, the printing ink industry experienced a consistent annual growth rate of about 5%."

The pause won't last long, however. For 1983 through 1987, the firm predicts that inks will pick up steam again at close to their traditional growth rate. That's not bad for a chemical product line these days, since most are forecast to grow more slowly in the 1980s than in the past two decades.

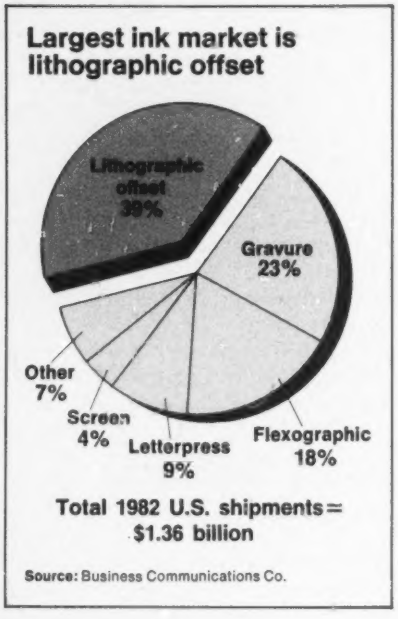
If it weren't for one problem market, inks would fully match their past growth rate in the 1980s. The trouble is in letterpress use, which Business Communications shows losing ground at 4.6% per year through 1987. This would pull down letterpress ink shipments' value from $125 million in 1982 to $100 million, and would decrease market percentage from 9% to 6%.

Otherwise, all other major outlets will move along at a rate of at least 5% per year, the company predicts. That goes for the largest use in lithographic offset printing, 39% of the total market in 1982 at $530 million. A renewed pickup at an average 5.0% per year through 1987 will put this market at $680 million.

The fastest growth will come for the second largest ink use—in gravure printing, which accounts for 23% of the total business at $310 million in 1982. Ink use for gravure printing will grow 6.5% per year



CIRCLE 64 ON READER SERVICE CARD



through 1987, the firm forecasts, when value will hit $425 million.

The other major use area is in flexographic printing, for which ink shipments are due for 5.3% annual growth from $250 million in 1982 to $325 million in 1987.

Sidelights of the Business Communications report on the ink business include items such as inks' use of raw materials—1.3 billion lb in 1982 worth about $750 million—and inks' share of raw materials costs in their major outlets—just 2 to 8% generally, except for nearly 20% in gravure printing. □

Outlook bright for sweetener raw material

Growth prospects for the synthetic sweetener aspartame are as high as the sky, and that means L-phenylalanine's are, too, according to one market research firm. L-Phenylalanine is one of the major raw materials of the G. D. Searle & Co. sweetener, now entering its third calendar year as a commercial product in the U.S.

According to a new study by Eldib Engineering & Research of Berkeley Heights, N.J., annual U.S. sales of L-phenylalanine, an essential amino acid, will rise from $2.5 million in 1982 to $77 million in 1987 for an average annual growth rate of almost 100%. Over the same span, the report says, aspartame demand will reshape L-phenylalanine's end-use market radically: Medical and nutritional applications, which account for more than 99% of annual sales now, will make up only 6% in 1987, despite solid growth. Aspartame will account for the rest.

There is a fly in the ointment, however—supply. As the Eldib report points out, the processes available to make L-phenylalanine (the isomer needed to make aspartame) are concentrated in the hands of the big Japanese amino acid producers, Ajinomoto, Kyowa Hakko, and Tanabe. All use a fermentation process that yields a product laden with impurities. Andrew Eldib, president of the research firm, notes that the purification process is elaborate and accounts for a significant part of the current cost of producing the amino acid.

In addition, the fermentation route is relatively slow and yields relatively fixed amounts of the product compared to the total volume of liquor. There are substantial recovery and waste disposal problems using this process.

"The Japanese companies are saying that with the fermentation process there are so many by-products, they must get away from it," Eldib says.

Where the Japanese and others interested in producing L-phenylalanine will go, the Eldib study predicts, is into synthetic production. Synthetic processes, starting from benzaldehyde and acetic acid, yield fewer impurities. On the other hand, they also yield DL-phenylalanine, from which the L isomer must be recovered. Nevertheless, the study argues, the profitable way to expand the supply of phenylalanine is through the synthetic route.

As of now, there is no commercial synthetic phenylalanine process. According to the Eldib study, Japanese, U.S., and European petrochemical producers currently are developing such processes.

The market for aspartame, the key to phenylalanine's future, will grow steadily around the world, the report says, as governments approve its use outside the U.S. Searle, which had global aspartame sales of about $14 million in 1981 and between $40 million and $50 million last year, expects to sell $500 million worth of the sweetener in 1986. To do so, two major hurdles will have to be overcome: one, Food & Drug Administration approval for the use of aspartame in soft drinks in the U.S.; and, two, a lower price for aspartame, currently far more expensive than saccharin.

It took Searle well over a decade to get FDA to approve aspartame for tabletop sweetening and for use in powdered drink mixes, dry cereals, puddings, gelatins, whipped toppings, and chewing gum. The next step—approval for use in soft drinks—will not take as long, the company confidently predicts. Searle anticipates the go-ahead sometime this year. The step is crucial, because, for the most part, aspartame's growth must come at the expense of saccharin, and 70% of saccharin's sales of $3 billion per year are in the soft drink sector.

Once approved, aspartame will have to battle doubts about its stability and shelf life, but the artificial sweetener's success in soft drinks in Canada, where both saccharin and cyclamates are banned, likely will help overcome them.

Less easy to overcome, however, could be the price differential between aspartame and saccharin. On a sweetening equivalency basis, aspartame is 20 to 30 times more expensive than saccharin. One development that would help: A process to make L-phenylalanine that could be sold for less than its current global price of $23 to $27 per lb.

Eldib's glowing forecast assumes both developments—FDA approval later this year and new, cheaper processes for both phenylalanine and aspartic acid, the other important amino acid ingredient in aspartame.

L-Phenylalanine supply is not overabundant even now, however, and it is possible there will be shortages as the aspartame market expands. "I'm not worried about the amino acid supply now," comments Eldib, "but we will have to at some point. Someone has to commit himself to producing it by a different process." □